Does ESG Disclosure Transparency Mitigate the COVID-19 Pandemic Shock? An Empirical Analysis of Listed Firms in the UK

Thi Hong Van Hoang, Linh Pham, Amine Lahiani, Elysé A. Segbotangni

In Journal of Innovation Economics & Management 2023/2 No 41 , pages 75 to 106
Publisher De Boeck Supérieur

ISBN 9782807399556
DOI 10.3917/e.jie.pr1.0131
Uploaded: 05/22/2023

Does ESG Disclosure Transparency Mitigate the COVID-19 Pandemic Shock? An Empirical Analysis of Listed Firms in the UK[1]

Thi Hong VAN HOANG
Chair of Social & Sustainable Finance
Montpellier Business School, Montpellier, France
thv.hoang@montpellier-bs.com

Linh PHAM
Economics Department, College of Business
University of Central Oklahoma, OK, USA
lpham17@uco.edu

Amine LAHIANI
CNRS, LEO, FRE, 2014, F-45067 Orléans
University of Orléans, France
amine.lahiani@univ-orleans.fr

Elysé A. SEGBOTANGNI
Montpellier Management Institute
University of Montpellier, Montpellier, France
segbotangni@gmail.com

1. *Acknowledgments:* The authors would like to thank the Editor, Professor Blandine Laperche (Université Littoral Côte d'Opale, France), the Guest Editors, Professors Marie Carpenter (Institut Mines-Télécom Business School, France), Walid Lamine (University of Pau and Pays de l'Adour, France), and Donia Trabelsi (Institut Mines-Télécome Business School, France), and the two anonymous Referees for their valuable comments and advice that helped us to significantly improve our manuscript. The authors also thank the participants in the research workshop "*Innover pour une finance responsable et durable*" organized by the Institut de Recherche en Gestion, Université Paris-EST Créteil, and the Institut Mines-Télécom Business School, on November 27, 2020. The authors are also very grateful to members of the Finance Research Group of Montpellier Research in Management, University of Montpellier, France, for their helpful comments during the research seminar on October 13, 2020. Any errors or shortcomings are the authors' responsibility.

DOI: 10.3917/jie.041.0075

ABSTRACT

This paper examines whether the ESG reporting transparency of listed firms in the UK can play a role in mitigating the impact of the COVID-19 pandemic. We investigate 350 UK firms in the FTSE350 index from 2016 to 2021 with daily data on stock performance and annual data on financial performance. The empirical results show that firms with a high ESG disclosure score have a lower volatility of stock performance during the COVID-19 pandemic. For these firms, the negative relationship between stock performance, as well as financial performance, and their main driving factors, is lower during the COVID-19 pandemic. Among these factors, we identify the lockdown announcement, quantitative easing announcement, and the intensity of news media coverage of the company. These results tend to indicate that the quantity of ESG data reported by firms can contribute to mitigating the impact of the COVID-19 pandemic on stock performance volatility and financial performance.

KEYWORDS: ESG Disclosure, COVID-19 Pandemic, Stock Performance, Financial Performance, UK FTSE350

JEL CODE: G3

The objective of this study is to investigate whether environmental, social, and governance (ESG) reporting transparency can contribute to mitigation of the impact of the COVID-19 pandemic on both the stock and financial performance of firms. This study is motivated by numerous professional financial analyses about the resilience of ESG funds during the COVID-19 pandemic (*e.g.*, Barbéris, Brière, 2020; Birkin and Stoess (2020). According to Barbéris and Brière (2020), in March 2020, while the MSCI World Index dropped by 14.5%, 62% of large-cap ESG funds outperformed the index. To explain this "pandemic-proof" phenomenon, the authors indicated that ESG funds tend to overweight sectors such as healthcare and technology, which are more resistant to the pandemic. Moreover, these funds tend to underweight sectors that are the most impacted by the pandemic, such as transport, energy, and materials. In this context, one can wonder whether this overperformance of ESG funds during the COVID-19 pandemic can also be related to the ESG reporting transparency of individual firms within the fund. Indeed, the ESG reporting transparency of firms allows asset managers to compose their funds and portfolios based on high-quality ESG data. This in turn helps them to better construct ESG funds. Therefore, in addition to the sectoral effect, as mentioned by Barbéris and Brière (2020), it is also important to consider the firm effect. In this study, we investigate whether the transparency of ESG reporting can contribute to mitigating the negative

impact of the pandemic on both the stock and financial performance of listed firms.

We are interested in ESG reporting transparency because there has been no clear and unique guide about ESG information to be disclosed by firms and asset management companies (Yu, Luu, 2021). Indeed, numerous ESG reporting standards exist, such as SASB, TFCD, GRI, IIRC, CDP, and UNGC. Thus, the amount of ESG information disclosed can vary from one company to another, from one asset management company to another, and from one country to another. In such a context, one can wonder whether a firm that makes efforts to provide high-quality ESG data is compensated for its effort with higher stock and financial performance or better resilience to unexpected shocks. This question is related to the nature of ESG reporting. Indeed, ESG reporting means providing firms' information related to the environment, society, and governance, associated with its activities. It also means revealing how the firm is engaged in corporate social responsibility (CSR) and in a long-term view of its strategies. Thus, one can suggest that a firm with more transparent ESG reporting is more engaged in ESG dimensions. Such firms would thus better integrate ESG risks and opportunities into their activities and strategies (Champagne *et al.*, 2021; Cerqueti *et al.*, 2021). This can therefore help these firms to better anticipate risk and be better prepared for unexpected shocks such as the COVID-19 pandemic. This research contributes to the debate on the relationship between innovations and sustainable finance because ESG reporting is strongly related to big data and artificial intelligence technologies. Indeed, due to the huge quantity and complexity of ESG data, innovations are necessary, and the findings of this research can help better understand the importance of big data technologies in sustainable finance. To this regard, numerous research works already investigated the role of technologies in finance (*e.g.*, Assadi *et al.*, 2018; Nigam *et al.*, 2018; Nguena, 2019; Ülgen, 2019).

With this motivation, our research is based on the ESG disclosure score provided by Bloomberg to measure the amount of ESG data provided by a company relating to the ESG data fields available on the Bloomberg terminal. Indeed, the Bloomberg ESG team follows the data fields defined by the Global Reporting Initiative (GRI). In 2020, there were more than 900 data fields available on the Bloomberg terminal, which covers almost 11 700 companies and 10 years of historical data. After collecting ESG data from financial and/or CSR reports for each firm, the Bloomberg ESG team attributes an ESG disclosure score to each company as a function of the quantity of ESG data disclosed. This score varies from 0.1 to 100 and allows investors to know the transparency of ESG reporting of the respective firm.

From this database, we select firms listed in the UK and members of the FTSE350 index over the 2016–2020 period (with annual data) and the 2018-2021 period (with daily data). The daily data sample allows us to measure the stock performance, while the annual data sample allows us to consider the financial performance of firms in an accounting sense. The UK is chosen because it was more impacted than other countries by the first wave of the COVID-19 pandemic in the spring of 2020.

With the objective of knowing whether the transparency of ESG reporting can contribute to mitigating the impact of the COVID-19 pandemic, we first compare the stock and financial performance among firms with high, low, and no ESG disclosure scores. The rate of return and the Sharpe and Treynor ratios are used to measure stock performance. The return on assets (ROA) and the return on common equity (ROE) are used to measure financial performance in an accounting sense. In the second step, we further investigate the relationship between the stock and financial performance of firms and their main driving factors, including ESG disclosure scores, women on the board, women employees, total assets, total liabilities, beta, market capitalization, and price-to-book ratio. In addition, we also consider investor sentiment proxied by analyst recommendations, news media attention paid to the firm (news heat), and oil prices (more details in Section 3). Importantly, factors related to the COVID-19 pandemic are also considered, including the numbers of cases and deaths, the lockdown announcement, and the quantitative easing announcement by the Bank of England.

With both daily and annual data, we consider two subperiods. With daily data, the pre-COVID-19 pandemic period is from July 2018 to February 2020, while the COVID-19 pandemic period is from March 2020 to July 2021. With annual data, the pre-COVID-19 pandemic period is 2016–2019, while the COVID-19 pandemic period is 2020. The empirical results show that the transparency of ESG reporting has a negative relationship with the volatility of stock performance during the COVID-19 pandemic. In addition, panel data regressions with both daily and annual data show that for firms with a higher ESG disclosure score, the negative relationship with COVID-19 factors is lower for both stock performance and financial performance. These findings indicate that the transparency of ESG reporting contributes to mitigating the stock performance volatility and negative shocks caused by the COVID-19 pandemic.

The remainder of the paper is organized as follows. Section 2 reviews the literature on the role of ESG in finance. Section 3 presents the dataset and methodology. Section 4 analyzes the empirical results, while Section 5 concludes the paper.

Literature Review

As mentioned above, the objective of this research is to investigate whether ESG reporting transparency can contribute to mitigating the effect of the COVID-19 pandemic. This research objective can be translated into three research questions as follows:

Research question 1: Are the stock performance and financial performance of firms with better ESG disclosure scores higher during the COVID-19 pandemic?

Research question 2: Are the stock performance and financial performance of firms with better ESG disclosure scores less volatile during the COVID-19 pandemic?

Research question 3: Are the stock performance and financial performance of firms with better ESG disclosure scores less negatively impacted by their main driving factors during the COVID-19 pandemic?

These three research questions are related to the relationship between ESG transparency/performance and firm performance/value. That is why in this literature review, we will focus on previous studies related to this relationship.

Although research on the effect of environmental and social factors on firms' performance have been conducted since the early 1970s, the results show inconclusive findings (Brooks, Oikonomou, 2018). This divergence of results continues to feed academic and professional debates. Furthermore, the consideration of ESG factors is increasingly integrated into firms' strategies. In the future, the COVID-19 pandemic will undoubtedly have a significant effect on the relationship between ESG factors and firms' value. In this regard, Selmi *et al.* (2021) showed that investors favor firms with strategies including environmental and social issues. Huang (2019) systematically reviewed these studies and concluded that most of them show a positive relationship between corporate ESG performance and corporate financial performance. Shafer and Szado (2019) found that good practices in each pillar of ESG (E, S, and G) can help firms reduce perceived tail risk.

With an increasing regulation on ESG reporting, the ESG dimensions of firms been increasingly examined by investors in their investment strategies. The concerns raised by the COVID-19 crisis have led firms to seek a balance between these three components of sustainability (Selmi *et al.*, 2021). Aerts *et al.* (2008) investigated the effect of environmental disclosure on the earnings forecasts of financial analysts in Europe and North America. The authors found that North American firms publish more environmental disclosures related to expenditures and risks. Perez de Toledo and Bocatto

(2014) showed that firms investing in ESG practices have a higher market value. Furthermore, firms with a high ESG score have an additional return of 13% compared to firms with a low ESG score. According to Yeon *et al.* (2021), CSR performance has a positive moderating effect on the relationship between the effects of the COVID-19 pandemic and firms' stock performance.

On the other hand, some empirical studies show an insignificant or negative relationship between ESG performance and financial performance (Bauer, Hann, 2010; Renneboog *et al.*, 2008; Brammer, Pavelin, 2006; Schuler, Cording, 2006). These research works note that ESG activities may represent a cost that can limit the financing of more profitable activities (Schuler, Cording, 2006). The authors further explained that ESG activities negatively affect long-term financial performance. In a similar study, Hoang *et al.* (2020) indicated that the impact of environmental factors on firms' financial performance differs over different time horizons.

Through this literature review, we see that despite the growing interest in recent research on the relationship between ESG factors and firm performance, the empirical results are not unanimous, which can lead to partial conclusions (Malik, 2015). Although there is heterogeneity in the empirical results, Brooks and Oikonomou (2018) and Malik (2015) showed in their literature reviews that there is consensus on a positive relationship between ESG factors and firms' financial performance. Additionally, the meta-analyses conducted by Lu and Taylor (2016) and Orlitzky *et al.* (2003) supported this positive relationship. Regarding firms' environmental transparency, stock markets tend to react positively in the context of economic prosperity (Hoang *et al.*, 2020). However, in times of crisis, environmental performance seems to have small effects on investors' decisions.

On the other hand, some studies show an insignificant relationship between ESG and portfolio returns. During the COVID-19 crisis, Bae *et al.* (2021) showed that there is no significant difference in stock returns between firms committed to CSR and those that are not. Across industries, the crisis does not seem to have a significant effect on the relationship between CSR and the financial performance of companies. In addition, the meta-analysis by Revelli and Viviani (2015) supported the idea that ESG factors have an insignificant effect on the performance of equity portfolios. Clark *et al.* (2021) noted that ESG factors have no significant effects on the financial performance of hospitality firms and do not allow for any financial predictions. Demers *et al.* (2021) confirmed the latter proposition that ESG indicators do not provide any positive explanatory power for stock returns during the COVID-19 crisis.

In response to the mixed results in the literature, Auer and Schuhmacher (2016) indicated that the geographic and industry orientation of a portfolio based on ESG measures can strongly affect the results. In particular, large listed firms and those operating in sensitive industries (*e.g.*, tobacco, armaments, alcohol, gambling) have a high ESG performance because of their higher level of ESG disclosure to protect their reputation (Garcia *et al.*, 2017). In these industries, high ESG disclosure positively affects stock performance. Furthermore, Haddock (2005) noted that publicly traded firms are more likely to disclose environmental and social information than unlisted firms. Several studies have shown that the level of ESG disclosure has a positive impact on firm value (*e.g.*, Li *et al.*, 2018; Fatemi *et al.*, 2018; Eccles *et al.*, 2014). In times of crisis, such as the COVID-19 pandemic, Arora *et al.* (2021) showed that there is a positive relationship between CSR activities and corporate shareholder value. Furthermore, of the three ESG components, only the governance indicator has a positive effect on firm performance, in contrast to the results of Rasimaki (2021). This finding shows that good governance can limit the undesirable effects of management in times of crisis.

Regarding the impact of crises, these periods of turmoil appear to have a significant effect on firms' value (*e.g.*, Bae *et al.*, 2021; Takahashi,Yamada, 2021; Hoang *et al.*, 2020; Lins *et al.*, 2017; Enikolopov *et al.*, 2014). The strength of this relationship is strongly associated with the trust of firms' stakeholders. Lins *et al.* (2017) showed that CSR activities are of paramount importance to firms' performance in times of crisis. In crisis periods, firms' CSR activities significantly affect the trust of stakeholders. Moreover, social trust seems to have a significant effect on the relationship between CSR and stock returns in times of crisis (Bae *et al.*, 2021; Lins *et al.*, 2017). This relationship therefore facilitates the impact of CSR on firm performance in the event of a negative shock (Bae *et al.*, 2021). Thus, firms with high CSR ratings have from 4 to 7 percentage points of higher stock returns than firms with low CSR ratings (Lins *et al.*, 2017). During the COVID-19 pandemic, Takahashi and Yamada (2021) found that high ESG scores led to high abnormal returns. In addition, stocks that are invested in by ESG funds have higher average returns than those that are not. According to Umar and Gubareva (2021), diversifying ESG investments during a systemic crisis appears to improve firms' financial potential. However, high ESG fund ownership is negatively associated with stock performance (Takahashi, Yamada, 2021). Furthermore, the relationship between environmental disclosure and financial performance appears to be stronger during the Global Financial Crisis (2007-2010) (Hoang *et al.*, 2020).

Interestingly, periods of crisis can be rewarding for firms committed to ESG issues. Indeed, the work of Broadstock *et al.* (2021) showed that ESG

performance empirically contributes to stock resilience during the COVID-19 crisis in China. According to the authors, investors may interpret a stock's ESG performance as the promise of future performance or of risk mitigation during a crisis. Enikolopov *et al.* (2014) reported that the relationship between ESG performance and firms' value depends strongly on the quality of the legal context in the country. Furthermore, firms' governance information disclosure appears to affect their stock price in times of crisis. For example, during the Asian crisis of 1997-1998, firms with a better governance disclosure had a better stock performance (Mitton, 2002). Enikolopov *et al.* (2014) further noted that the level of firms' governance disclosure and investors' protection are complementary factors in times of crisis. Fosu *et al.* (2016) showed that information asymmetry among firms' stakeholders negatively affects its value in times of crisis, especially in postcrisis periods.

We note that although the results can differ according to the countries, sectors, and periods considered, most studies have shown that there is a significant relationship between ESG and firm performance. Furthermore, crises can have significant impacts on this relationship. To the best of our knowledge, no study has investigated both stock and financial performance nor the distinction among firms with high, low, and no ESG disclosure scores. Furthermore, to the best of our knowledge, no study has investigated the direct impact of the numbers of COVID-19 cases, deaths, the lockdown announcement, and the quantitative easing announcement on the stock and accounting performance of UK firms. Our study thus contributes to the literature by analyzing the impact of ESG reporting transparency on both stock and financial performance of UK firms before and during the COVID-19 pandemic. This would help both financial academics and professionals better understand the relation between ESG transparency and firms' resilience during the COVID-19 pandemic.

Data and Methodology

With the objective of knowing whether transparency in ESG reporting can contribute to mitigating the impact of the COVID-19 pandemic on both stock and financial performance, we decided to study listed firms in the UK in the FTSE350 index. The UK was chosen because it was more impacted than other countries by the first wave of the COVID-19 pandemic in 2020. Furthermore, there is a high number of firms with available ESG disclosure score data in the UK. With this choice to study UK firms, our data samples are constructed as follows.

First, we start with the 350 companies in the FTSE350 index in July 2021, the date when we started collecting data. Second, we divide the sample into three subsamples. The first subsample is composed of 132 firms with an ESG disclosure score in 2020 higher than the median score of the sampled firms in 2020, which is 38.43. The second subsample is composed of 134 firms with an ESG disclosure score in 2020 under the median. The third subsample is composed of 84 firms that have no ESG disclosure score in 2020. These latter are companies that are not covered by the ESG group or that do not provide any ESG information. The year 2020 is chosen to collect the ESG disclosure score because it is the year when the COVID-19 pandemic started.

Second, for each of these three subsamples, we collect two types of data. The first uses data at a daily frequency to measure stock performance. The data fields collected for daily data analysis are stock prices, beta, market capitalization, news heat (more details below), and oil prices. The period considered for daily data is from 07/27/2018 to 07/27/2021. The start date is 07/27/2018 because it allows us to have a sufficiently long period while allowing us to have a maximum amount of available data. With the objective of studying the impact of the COVID-19 pandemic, we divide the whole period with daily data into two subperiods. The first subperiod is from 07/27/2018 to 02/28/2020 and is considered the pre-COVID-19 period. The second subperiod is from 03/02/2020 to 07/27/2021 and is considered the COVID-19 period. For the second subperiod, additional COVID-19-related variables are considered, such as the daily variation in the numbers of cases and deaths due to COVID-19, a dummy variable for the lockdown announcement date in the UK (02/23/2020), and a dummy variable for the quantitative easing announcement date by the Bank of England (03/19/2020). Note that for the daily data sample, the ESG disclosure score of 2020 is used only to divide the whole sample into three subsamples, according to the 2020 ESG disclosure score level. To be able to investigate the direct interaction between ESG disclosure and firms' financial performance, we need to go further with annual data, as we explain below.

Third, we collected annual data for each of the subsamples (with high, low, and no ESG disclosure scores defined above). Indeed, in the daily data sample, we cannot have data for the ESG disclosure score, as this is published only annually. That is why we also consider an annual data sample for the 2016–2020 period. The start year is 2016 because we have the most ESG disclosure score data starting in this year. The data fields collected with annual data are ESG disclosure score, return on assets (ROA), return on common equity (ROE), total assets, total liabilities, news heat, price to book ratio, women employees, women on board, beta, and analyst recommendations. A dummy

variable for 2020 is also considered, as it is the year when the COVID-19 pandemic started.

For the *daily data*, we estimate two different regressions, one for the pre-COVID-19 period and one for the COVID-19 period. We use three different stock performance indicators: the rate of return, Sharpe ratio, and Treynor ratio. These three indicators are chosen because they are widely used by both financial academics and professionals for their simplicity and ease of interpretation. With these three indicators, the equations that we estimate are as follows:

- *Pre-COVID-19 period*:

$$Return_{i,t} = \alpha + \beta_1 Beta_{i,t} + \beta_2 Ln(Cap)_{i,t} + \beta_3 News_{i,t} + \beta_4 Oil_t + \gamma_t + \vartheta_i + \varepsilon_{i,t} \quad (1a)$$

$$Sharpe_{i,t} = \alpha + \beta_1 Beta_{i,t} + \beta_2 Ln(Cap)_{i,t} + \beta_3 News_{i,t} + \beta_4 Oil_t + \gamma_t + \vartheta_i + \varepsilon_{i,t} \quad (1b)$$

$$Treynor_{i,t} = \alpha + \beta_1 Beta_{i,t} + \beta_2 Ln(Cap)_{i,t} + \beta_3 News_{i,t} + \beta_4 Oil_t + \gamma_t + \vartheta_i + \varepsilon_{i,t} \quad (1c)$$

where $Return_{i,t}$ is the logarithmic rate of return:

$$Return_{i,t} = \ln\left({}^{P_t}/_{P_{t-1}}\right)$$

$Sharpe_{i,t}$ is the Sharpe ratio, a stock performance measure:

$$Sharpe_{i,t} = \frac{R_{i,t} - R_f}{\sigma_i}$$

$Treynor_{i,t}$ is the Treynor ratio, a stock performance measure:

$$Treynor_{i,t} = \frac{R_{i,t} - R_f}{\beta_i}$$

The other variables are the beta coefficient, logarithmic value of market capitalization, news heat, and oil prices (see below). The generalized method of moments (GMM) is used for the estimation process (more details below). γ_t captures the time effect, while ϑ_i captures the firm effect.

For the COVID-19 period, the equation is as follows.

- *COVID-19 period*:

$$Return_{i,t} = \alpha + \beta_1 Beta_{i,t} + \beta_2 Ln(Cap)_{i,t} + \beta_3 News_{i,t} + \beta_4 Oil_t + \boldsymbol{\beta_5 Cases_t} + \boldsymbol{\beta_6 Deaths_t} + \boldsymbol{\beta_7 D_{Lockdown}} + \boldsymbol{\beta_8 D_{QE}} + \gamma_t + \vartheta_i + \varepsilon_{i,t} \quad (2a)$$

$$Sharpe_{i,t} = \alpha + \beta_1 Beta_{i,t} + \beta_2 Ln(Cap)_{i,t} + \beta_3 News_{i,t} + \beta_4 Oil_t + \boldsymbol{\beta_5 Cases_t} + \boldsymbol{\beta_6 Deaths_t} + \boldsymbol{\beta_7 D_{Lockdown}} + \boldsymbol{\beta_8 D_{QE}} + \gamma_t + \vartheta_i + \varepsilon_{i,t} \quad (2b)$$

$$Treynor_{i,t} = \alpha + \beta_1 Beta_{i,t} + \beta_2 Ln(Cap)_{i,t} + \beta_3 News_{i,t} + \beta_4 Oil_t + \boldsymbol{\beta_5 Cases_t} + \boldsymbol{\beta_6 Deaths_t} + \boldsymbol{\beta_7 D_{Lockdown}} + \boldsymbol{\beta_8 D_{QE}} + \gamma_t + \vartheta_i + \varepsilon_{i,t} \quad (2c)$$

For the COVID-19 period, some new variables related to the pandemic are considered, including the daily variation in the numbers of COVID-19 cases and deaths (the value of the day after minus the value of the day before). Two dummy variables are also considered. The first, $D_{Lockdown}$, captures the effect of the lockdown announcement in the UK, which was on 03/23/2020. The

second dummy variable, D_{QE}, captures the effect of the quantitative easing announcement by the Bank of England, which was on 03/19/2020.

For the *annual data*, the regressions that we estimate by GMM are as follows:

$$\boldsymbol{ROA_{i,t}} = \alpha + \beta_1 \boldsymbol{ESG_{i,t}} + \beta_2 Ln(TA)_{i,t} + \beta_3 (TL\_TA)_{i,t} + \beta_4 News_{i,t} + \beta_5 PBR_{i,t} + \beta_6 Wo\_Em_{i,t} + \beta_7 Wo\_Bo_{i,t} + \beta_8 Beta_{i,t} + \beta_9 Analyst_{i,t} + \beta_{10} D_{2020} + \gamma_t + \vartheta_i + \varepsilon_{i,t} \quad (3a)$$

$$\boldsymbol{ROE_{i,t}} = \alpha + \beta_1 \boldsymbol{ESG_{i,t}} + \beta_2 Ln(TA)_{i,t} + \beta_3 (TL\_TA)_{i,t} + \beta_4 News_{i,t} + \beta_5 PBR_{i,t} + \beta_6 Wo\_Em_{i,t} + \beta_7 Wo\_Bo_{i,t} + \beta_8 Beta_{i,t} + \beta_9 Analyst_{i,t} + \beta_{10} D_{2020} + \gamma_t + \vartheta_i + \varepsilon_{i,t} \quad (3b)$$

where $ROA_{i,t}$ denotes the return on assets of company *i* in year *t*, a proxy for financial performance in an accounting sense, related to the company's assets. $ROE_{i,t}$ denotes the return on equity, a proxy for financial performance in an accounting sense, related to shareholders' equity. $ESG_{i,t}$ denotes the ESG disclosure score (see above). *Ln*(*TA)* denotes the logarithmic value of total assets, a proxy for the size of the company. *TL_TA* denotes the firm's capital structure, which is the ratio between total liabilities and total assets. *News* denotes the news heat variable (see below), a proxy for investor sentiment. *PBR* denotes the price-to-book ratio, a proxy for the firm's valuation by the market. *Wo_Em* denotes the percentage of women among employees, a proxy for the social performance of firms. *Wo_Bo* denotes the percentage of women among the board members, a proxy for the governance of firms. *Beta* denotes the beta coefficient, a proxy for systematic risk. *Analyst* denotes the analyst recommendation, a proxy for investor sentiment (see below). D_{2020} denotes a dummy variable that is equal to 1 for 2020 and 0 otherwise. As a reminder, the study period with annual data is from 2016 to 2020. Both *ROA* and *ROE* are considered to measure financial performance because *ROA* is related to the assets of the company, while *ROE* is related to the equity of the company. Note that with annual data, we only have two subsamples, one with a high ESG disclosure score and one with a low ESG disclosure score. We cannot consider firms in subsample 3 (see daily data above) in the annual data analysis because there are no ESG data to be included on the right side of Equations (3a) and (3b).

Table 1 summarizes all subsamples, subperiods, and data fields considered in our study.

***Table 1* – Summary of the data samples and of the considered variables**

Daily data	**3 subsamples and two subperiods**
Subsample 1 - High ESG disclosure score	132 firms
Subsample 2 - Low ESG disclosure score	134 firms
Subsample 3 - No ESG disclosure score	84 firms
Subperiod 1 - Pre-COVID-19	07/27/2018–02/28/2020
Subperiod 2 - COVID-19 period	03/02/2020–07/27/2021
Variables considered	Stock prices, beta, capitalization, news heat, oil prices, Libor rate
	Covid-19 cases and deaths, lockdown and QE announcement dates
Annual data	**2 subsamples and one period (2016–2020)**
Subsample 1 - High ESG disclosure score	132 firms
Subsample 2 - Low ESG disclosure score	134 firms
No subsample 3	Missing annual data
Variables considered	ROA, ROE, ESG disclosure score, total assets, total liabilities,
	price-to-book ratio, women employees, women on board, beta
	analyst recommendation, news heat, dummy variable for 2020.

Note: The data for the Libor rate are also collected as a risk-free rate for firms in the UK in the calculation of the Sharpe and Treynor ratios (see above).

Among the considered variables, our contribution to the ESG literature is related to the choice of proxies to measure investors' sentiment, which are analysts' recommendations, news heat, and oil prices. Analysts' recommendations are a proxy for investors' sentiment because they show what analysts think about a company's stock while recommending to buy or to sell it. On the Bloomberg terminal, a rating scale between 1 and 5 is used. A score of 5 is the strongest ranking (with a recommendation to buy or similar), whereas a rating of 1 is the weakest (a recommendation to sell or similar). The second proxy for investors' sentiment is the news heat variable. It is a proxy for investors' sentiment because it measures the number of news articles related to the company published in the media. On the Bloomberg terminal, the news heat variable represents the average value of news publication heat for the parent company over a 24-hour period in all languages.[2]

2. A score of 4 represents publication activity in the top 98th percentile of the publication volume over the last 45 days. A score of 3 represents the top 96th percentile. A score of 2 represents the top 90th percentile. A

Finally, oil prices can be used as a proxy for investors' sentiment because a variation in oil prices can reflect changes in the fundamentals of the economy, including the production and consumption process. On the other hand, previous academic studies show that there is a strong connection between oil prices and investors' sentiment. For example, Qadan and Nama (2018) showed that unanticipated shocks to oil prices affect investor sentiment. In the same way, Ding *et al.* (2017) found that crude oil prices have a contagion effect on stock market investor sentiment. Finally, we chose to also include proxies for gender diversity (women employees and women on board) in the estimated regressions because previous studies demonstrated that this is a driving factor of the financial performance of firms (*e.g.*, Hoang *et al.*, 2021; Mather *et al.*, 2021; Mohsni *et al.*, 2021).

Before estimating the regressions presented above, we first compare the stock performance and its volatility between the three subsamples and the two subperiods for daily data. To do so, we conduct a t-test to compare the average stock performance and a Fisher-test to compare their variances.

To estimate the parameters in Equations (1) and (2) above, we follow Baños-Caballero *et al.* (2012) and Aytaç *et al.* (2020) to use the two-step GMM developed by Arellano and Bond (1991). This method helps avoid unobservable heterogeneity among firms and possible endogeneity. Indeed, firms are heterogeneous and it is not possible to consider all the factors that impact stock performance (the independent variable). Regarding the endogeneity issue, the two-step GMM method allows us to resolve it by using an instrumental variable estimation method in the first estimation step. As is usually the case, the instrumental variable is lagged values of the independent variable. Lagged values of between 2 and 30 periods are tested, and the lagged values that provide the best estimation quality are used as instrumental variables. To measure the goodness-of-fit of the estimation, we include the AR(1) and AR(2) tests and the Sargan-Hansen test in the results. Indeed, AR(1) and AR(2) are the first- and second-order serial correlation tests on the residuals, asymptotically distributed as N(0,1) under the null hypothesis of no serial correlation. This test allows us to know whether the endogeneity issue persists. The Sargan-Hansen test also allows us to know whether the model is well identified because it is a test of overidentifying restrictions distributed asymptotically as chi-square under the null hypothesis of the validity of instruments. Stata software is used to perform the GMM estimation.

score of 1 represents the top 80th percentile.

Empirical Results

Descriptive Statistics of Daily Data – Stock Performance

Table 2A **– Descriptive statistics with daily data – Stock performance**

Tables 2A and 2B present the main descriptive statistics for 350 listed firms in the UK in the FTSE350 index. This initial sample is divided into three subsamples (with high, low, and no ESG disclosure scores), and into two subperiods (before and during the COVID-19 pandemic).

From Table 2A for the pre-COVID-19 period, we obtain the following information. The stock performance of firms in all three subsamples was negative, with a higher negative value for firms with a high ESG disclosure score. We also note that the volatility of the three measures of stock performance is slightly lower for firms with low or no ESG disclosure scores. For the beta, we note that it is higher for firms with a high ESG disclosure score. The same is true for market capitalization. The news heat is higher for firms with a high ESG disclosure score.

Table 2B for the COVID-19 period indicates that the results are very similar to those before the COVID-19 pandemic (Table 2A). Stock performance is always slightly higher for firms with low or no ESG disclosure scores. The beta is always higher for firms with a high ESG disclosure score. The same observation is found for market capitalization and news heat. Importantly, regarding the standard deviation, we note that during the COVID-19 pandemic, it becomes higher for firms with a low ESG disclosure score. This is true for the three stock performance measures.

From Table 3, regarding the Sharpe ratio, before the COVID-19 pandemic, firms with a high ESG disclosure score have a lower Sharpe ratio than firms with a low or no ESG disclosure score. For the volatility of the Sharpe ratio, having a high ESG disclosure score does not reduce volatility. For the COVID-19 pandemic period, the results remain the same, except that a high ESG disclosure score can contribute to reducing the volatility of the Sharpe ratio. Regarding the Treynor ratio, before the COVID-19 pandemic, Table 3 shows that the results are quite similar, meaning that a high ESG disclosure score does not help improve the performance nor its volatility. However, during the COVID-19 pandemic, we see that a high ESG disclosure score helps reduce the volatility of stock performance.

Panel A: Before COVID-19 (27/07/2018-28/02/2020)						
	Mean	**Std. Dev.**	**Min**	**Max**	**Skewness**	**Kurtosis**
Sample 1 – High ESG disclosure score (132 firms)						
Return	-0.0004***	0.0194	-1.2642	0.2967	-5.9925	351.9945
Sharpe ratio	-0.0216***	0.9997	-17.5834	16.0423	-.5196	14.0599
Treynor ratio	-0.001	0.1775	-35.98	11.472	-148.1708	31240.82
Beta	0.8562***	0.3609	-0.102	2.6258	1.099	4.7671
Capitalization	17075.147***	32553.801	451.4908	222683.32	3.5032	16.7158
News	0.3703***	0.4716	0	3.667	2.0069	7.5854
Sample 2 – Low ESG disclosure score (134 firms)						
Return	-0.0001	0.0202	-0.4121	0.5746	-0.0318	42.2854
Sharpe ratio	-0.0053	0.9997	-14.3186	16.892	-0.0819	14.8881
Treynor ratio	-0.0004	0.0617	-4.4711	3.4379	-14.2	1615.3525
Beta	0.7046***	0.2945	-0.4441	1.6875	0.4817	3.1897
Capitalization	2731.0077***	2353.8488	12.2481	17149.328	1.8152	7.0495
News	0.2042***	0.2991	0	2.917	3.3184	18.5641
Sample 3 – No ESG disclosure score (84 firms)						
Return	0.0000	0.0133	-0.3739	0.3046	-1.8627	80.1168
Sharpe ratio	-0.0092	0.9993	-10.5681	10.1661	-0.4298	8.6579
Treynor ratio	0.0006	0.1484	-4.9131	23.4151	127.0672	20250.54
Beta	0.6161***	0.328	-0.2119	1.477	-0.029	2.1104
News	0.1989	0.201	0	2.708	2.6945	13.2574
Oil price	*65.7145***	*7.1009*	*50.47*	*86.29*	*0.6278*	*3.004*

Notes: See Section 3 for the definition of each variable.

Table 2B – Descriptive statistics with daily data – Stock performance

Panel B: COVID-19 (02/03/2020-27/07/2021)						
	Mean	**Std. Dev.**	**Min**	**Max**	**Skewness**	**Kurtosis**
Sample 1 – High ESG disclosure score (132 firms)						
Return	0.0002	0.032	-0.8548	0.392	-0.9163	35.3662
Sharpe ratio	0.0097**	0.9991	-13.8417	12.997	-0.2242	12.7146
Treynor ratio	0	0.0327	-0.6894	0.7741	-0.7387	32.2476
Beta	1.0427***	0.3947	0.2477	3.4281	0.8124	4.1006
Capitalization	14305.194***	24357.536	65.9702	136194.61	2.7185	10.0009
News	0.3732***	0.4806	0	4	2.1301	8.7465
Sample 2 – Low ESG disclosure score (134 firms)						
Return	0.0003**	0.0334	-0.7649	0.9228	0.1033	58.0537
Sharpe ratio	0.0162***	0.9992	-14.267	11.8588	-0.0966	15.0709
Treynor ratio	0.0002	0.0473	-4.7299	4.1075	-7.274	3212.4
Beta	0.9288***	0.3674	-0.1957	2.1639	0.5798	3.2652
Capitalization	2980.1687***	3402.2623	22.1409	29619.074	3.1439	16.2236
News	0.1806***	0.2956	0	3.416	3.3999	19.372
Sample 3 – No ESG disclosure score (84 firms)						
Return	0.0005***	0.0223	-0.298	0.3013	-0.4212	24.1113
Sharpe ratio	0.0264***	0.9991	-11.2691	11.0041	-0.3128	17.092
Treynor ratio	0.0002	0.037	-1.7152	0.8442	-4.8017	228.3085
Beta	0.7779***	0.237	0.0282	1.36	-0.3203	2.5105
News	0.1587***	0.1725	0	1.886	2.1606	10.1366
Oil price	*50.6079****	*14.7176*	*19.33*	*77.16*	*0.0784*	*1.9845*
Cases	*15701.834****	*23396.697*	*2*	*171933*	*3.0827*	*15.778*
Deaths	*352.752****	*482.7225*	*0*	*2583*	*1.9237*	*6.9841*

Notes: See the notes for Table 2A.

Table 3 – T test and Fisher test with daily data

	Before the COVID-19 pandemic			**During the COVID-19 pandemic**		
	27/07/2018-28/02/2020			**02/03/2020-27/07/2021**		
	Sample 1 vs. Sample 2	**Sample 1 vs. Sample 3**	**Sample 2 vs. Sample 3**	**Sample 1 vs. Sample 2**	**Sample 1 vs. Sample 3**	**Sample 2 vs. Sample 3**
Return						
T test	-2.4498** [0.0143]	-2.9605*** [0.0031]	-0.5994 [0.5489]	-0.9265 [0.3542]	-1.6355 [0.1019]	-0.7269 [0.4673]
F test	0.9266*** [0.0000]	2.1196*** [0.0000]	2.2874*** [0.0000]	0.9194*** [0.0000]	2.0520*** [0.0000]	2.2319*** [0.0000]
Sharpe						
T test	-2.7033*** [0.0069]	-1.7377* [0.0823]	0.5468 [0.5845]	-1.0111 [0.3120]	-2.1796** [0.0293]	-1.3280 [0.1842]
F test	1.0001 [0.9940]	1.0008 [0.9379]	1.0007 [0.9428]	0.9999 [0.9887]	1.0001 [0.9952]	1.0002 [0.9857]
Treynor						
T test	-0.7857 [0.4321]	-1.3438 [0.1790]	-1.3583 [0.1744]	-0.6284 [0.5297]	-0.5862 [0.5577]	0.0340 [0.9728]
F test	8.2894*** [0.0000]	1.4308*** [0.0000]	0.1726*** [0.0000]	0.4774*** [0.0000]	0.7791*** [0.0000]	1.6319*** [0.0000]

Notes: The figures in brackets show the probability. ***means that the null hypothesis on the equality of the average and variance is rejected at 1%. No asterisk means that the null hypothesis is not rejected.

Panel Data Regressions' Results with Daily Data – Stock Performance

Table 4 presents the results obtained from the GMM panel data regression applied to daily data for the three subsamples. Panel 4A presents the results for the pre-COVID-19 period, while Panel 4B presents the results for the COVID-19 period.

Table 4A for the pre-COVID-19 period provides the following results. First, we note that the relationship of the considered factors with the three stock performance measures varies across the samples and the measure considered. If we consider the rate of return, we note that the beta has a significant and positive estimated coefficient for firms in sample 1, while this is not the case for firms in samples 2 and 3. The same result is found for market capitalization. However, for oil prices, the coefficient is significantly positive for both sample 1 and sample 2. If we look at the Sharpe ratio, the result changes for market capitalization, as it also has a significant and positive coefficient for firms in sample 2. Regarding the Treynor ratio, the result is quite different, as only market capitalization and oil prices have a significant and positive coefficient for firms in sample 1 and sample 2, respectively. On the other hand, for sample 3, the only factor that has a significant and positive coefficient is oil prices before the COVID-19 pandemic.

Table 4B, reporting findings for the COVID-19 period, shows very different results compared to the pre-COVID-19 period, as there are many more factors that have a significant coefficient with stock performance measured by the return, Sharpe ratio, and Treynor ratio. Regarding the return, the factors that have a significant coefficient are beta, market capitalization, news heat, oil prices, the number of deaths due to the COVID-19 pandemic, the lockdown announcement and the quantitative easing announcement. However, we note that the value and sign of the abovementioned coefficients are different for each firm sample. For example, the value of positive coefficients is higher for firms in sample 1 than for firms in sample 2. In contrast, the value of negative coefficients is higher for firms in sample 2 than for firms in sample 1, in most cases. From this result, we note that the ESG disclosure score level, according to the three firm samples, can influence how driving factors interact with stock performance. Similar results are found for the Sharpe ratio and Treynor ratio.

Panel Data Regressions' Results with Annual Data – Financial Performance

Before presenting the panel data regression results with annual data, we present the main descriptive statistics in Table 5. Panel A of Table 5 is related to the pre-COVID-19 period (2016–2019), while Panel B is related to the COVID-19 period (2020). In each panel, we present annual descriptive statistics for sample 1 (with a high ESG disclosure score) and for sample 2 (with a low ESG disclosure score). Sample 3 is not considered in this annual data analysis due to the lack of data (see Section 3 above).

The first observation that we can draw from Table 5 is that the financial performance of firms with a high ESG disclosure score is lower than that of firms with a low ESG disclosure score, as measured by both ROA and ROE. The second observation from Table 5 is that the financial performance of all the sampled firms decreased substantially during the COVID-19 pandemic in 2020. Interestingly, the ESG disclosure score increased in 2020 compared to that from 2016 to 2019. This finding confirms previous analyses about the positive impact of the COVID-19 pandemic on the CSR engagement of firms (He, Harris, 2020). In addition, the size of firms with a high ESG disclosure score is larger than that of firms with a low ESG disclosure score. This confirms findings in Hoang *et al.* (2020) and Yu and Luu (2021), according to which larger firms are more willing to engage in ESG reporting. Regarding the capital structure (the ratio between total liabilities and total assets, TL/TA), we note that firms with a high ESG disclosure score have more debt relative to equity than firms with a low ESG disclosure score. The price-to-book ratio is much higher for firms with a high ESG disclosure score before the COVID-19 pandemic. However, the reverse was true during the COVID-19 pandemic. The percentage of women employees and women on board are slightly lower for firms with a high ESG disclosure score than for firms with a low ESG disclosure score. The beta coefficient is lower for firms with a high ESG disclosure score during the COVID-19 pandemic period, while the reverse is true before the COVID-19 pandemic.

Table 6 presents the panel data regression results obtained with annual data and shows that most of the considered factors do not have a significant estimated coefficient, and thus a significant relation, with the financial performance of firms, measured by ROA and ROE. However, there are some exceptions and these exceptions show the difference between firms with high and low ESG disclosure scores. Regarding ROA, the first difference is related to the coefficient of firm size (measured by total assets). There is a significant and negative coefficient for firms in sample 2, while it is not the case for firms in sample 1.

Table 4A – GMM panel regression results for daily data

Pre-COVID	**Returns**			**Sharpe ratio**			**Treynor ratio**		
	Sample 1	**Sample 2**	**Sample 3**	**Sample 1**	**Sample 2**	**Sample 3**	**Sample 1**	**Sample 2**	**Sample 3**
Beta	0.1394***	-0.0262	-0.2056	7.4412***	-1.6481	-16.9257	0.3925	0.0047	-0.5298
	(0.0495)	(0.0250)	(0.1543)	(2.6308)	(1.0410)	(12.3089)	(0.2466)	(0.1109)	(0.4033)
Cap	0.0581***	0.0088		3.1079***	0.7355*		0.1599*	-0.0080	
	(0.0220)	(0.0088)		(1.1521)	(0.4324)		(0.0926)	(0.0183)	
News	-0.0018	-0.0010	-0.0017	-0.0664	-0.0480	-0.1879	-0.0002	0.0014	-0.0046
	(0.0014)	(0.0017)	(0.0023)	(0.0754)	(0.0880)	(0.1995)	(0.0029)	(0.0035)	(0.0166)
Oil	0.1788***	0.1022***	0.1467***	10.2025***	5.0089***	14.2822***	0.0006	0.1405***	0.4069**
	(0.0172)	(0.0160)	(0.0160)	(0.9736)	(0.8190)	(1.1795)	(0.1965)	(0.0329)	(0.1617)
N	54780	55610	30710	54780	55610	30710	54780	55610	30710
Hansen test	129.9935	132.3278	67.7042	130.9638	130.5224	70.5480	130.5905	130.0838	70.9740
	[0.1768]	[0.1426]	[0.9274]	[0.1620]	[0.1686]	[0.8860]	[0.1676]	[0.1754]	[0.8787]
AR(1) test	-6.8169	-8.7250	-5.1155	-11.3622	-11.3851	-8.4782	-1.0160	-1.7982	-1.1710
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.3096]	[0.0721]	[0.2416]
AR(2) test	0.2598	1.7391	2.5578	-0.2774	2.3947	4.4071	0.9992	0.6890	1.5019
	[0.7950]	[0.0820]	[0.0105]	[0.7815]	[0.0166]	[0.0000]	[0.3177]	[0.4908]	[0.1331]

Note: The standard errors are given in parentheses. *, **and *** indicate significance at the 10%, 5% and 1% levels, respectively. Sample 1 is composed of firms with a high ESG disclosure score (132 firms). Sample 2 is composed of firms with a low ESG disclosure score (134 firms). Sample 3 comprises firms without an ESG disclosure score (84 firms).

Table 4B – GMM panel regression results for daily data

COVID	Returns			Sharpe ratio			Treynor ratio		
	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3
Beta	0.1711***	0.1659***	0.0535	2.5896***	3.0059***	1.8903	0.1074***	0.3653*	0.2838**
	(0.0475)	(0.0469)	(0.0693)	(0.9806)	(0.9188)	(3.2178)	(0.0376)	(0.1893)	(0.1198)
Cap	0.0790***	0.0551***		1.4496***	0.9817***		0.0580***	0.0907	
	(0.0209)	(0.0139)		(0.3724)	(0.2619)		(0.0128)	(0.0560)	
News	-0.0044**	-0.0136***	-0.0259***	-0.1129*	-0.3863***	-1.4562***	-0.0028	-0.0180***	-0.0438***
	(0.0020)	(0.0042)	(0.0066)	(0.0579)	(0.1321)	(0.3287)	(0.0019)	(0.0061)	(0.0117)
Oil	0.2384***	0.1696***	0.1058***	7.2469***	5.1521***	5.1123***	0.2166***	0.2225***	0.1613***
	(0.0193)	(0.0132)	(0.0128)	(0.3373)	(0.3361)	(0.5290)	(0.0098)	(0.0482)	(0.0178)
Cases	-0.0001	0.0003	0.0008***	-0.0069	0.0122*	0.0413***	-0.0000	0.0015	0.0016***
	(0.0002)	(0.0002)	(0.0002)	(0.0075)	(0.0073)	(0.0124)	(0.0002)	(0.0009)	(0.0004)
Deaths	0.0020***	0.0013**	0.0008	0.0703***	0.0531***	0.0496	0.0024***	-0.0002	-0.0002
	(0.0005)	(0.0006)	(0.0008)	(0.0116)	(0.0137)	(0.0391)	(0.0004)	(0.0019)	(0.0013)
Lockdown	-0.0650***	-0.0638***	-0.0971***	-2.4734***	-2.3553***	-4.9789***	-0.0697***	-0.0354	-0.1361***
	(0.0062)	(0.0066)	(0.0098)	(0.2101)	(0.2319)	(0.4247)	(0.0066)	(0.0417)	(0.0158)
QE	-0.0424***	-0.0060	-0.0385***	-1.5067***	-0.5204	-1.8195***	-0.0491***	-0.0094	-0.0614***
	(0.0079)	(0.0104)	(0.0082)	(0.2660)	(0.3249)	(0.3782)	(0.0093)	(0.0166)	(0.0145)
N	54780	55610	26492	54780	55610	25776	54780	55610	26492
Hansen test	129.9935	132.3278	69.8195	130.9638	130.5224	70.5616	130.5905	130.0838	72.0526
	[0.1768]	[0.1426]	0.8830	[0.1620]	[0.1686]	0.8697	[0.1676]	[0.1754]	0.8405
AR(1) test	-6.8169	-8.7250	-7.0163	-11.3622	-11.3851	-8.1836	-1.0160	-1.7982	-5.9186
	[0.0000]	[0.0000]	0.0000	[0.0000]	[0.0000]	0.0000	[0.3096]	[0.0721]	0.0000
AR(2) test	0.2598	1.7391	1.1467	-0.2774	2.3947	1.6970	0.9992	0.6890	0.1751
	[0.7950]	[0.0820]	0.2515	[0.7815]	[0.0166]	0.0897	[0.3177]	[0.4908]	0.8610

Note: See the notes to Table 4A.

Table 5 – Descriptive statistics with annual data – Financial performance

Panel A: Before COVID-19 (2016-2019)						
	Mean	**Std. Dev.**	**Min**	**Max**	**Skewness**	**Kurtosis**
Sample 1 – High ESG dislcosure score (132 firms)						
ROA	5.2469***	7.2565	-43.1995	49.9963	0.2701	12.1944
ROE	17.7875***	30.4999	-117.2775	242.2636	3.145	26.0664
ESG	48.0572***	8.5095	27.2727	72.6141	0.364	2.692
Ln(TA)	9.2676***	1.9002	5.8084	14.8144	0.7739	3.1424
TL/TA	0.6115***	0.2218	0.0392	1.1039	-0.1576	2.2275
News	0.3108***	0.3962	0	2.458	2.2796	9.1134
PBR	3.3853***	5.2799	0.4647	68.2349	8.2913	95.7394
Wo Em	36.0327***	15.9662	1	77.89	0.2003	2.2489
Wo Bo	26.3699***	9.6196	0	54.546	-0.0037	2.9441
Beta	1.3181***	6.2869	-29.6449	59.9796	2.0924	24.1145
Analyst	3.6998***	0.6123	1.9	5	-0.3098	2.799
Sample 2 – Low ESG disclosure score (134 firms)						
ROA	9.5939***	22.6529	-36.7762	236.7815	7.8475	75.2927
ROE	33.5406***	128.5008	-104.6269	1764.9976	9.1787	100.9663
ESG	31.6917***	4.2265	17.7686	46.281	0.0226	3.2457
Ln(TA)	7.5399***	1.3392	3.9493	12.3995	0.4518	4.1606
TL/TA	0.5596***	0.2158	0.0337	1.1296	-0.0488	2.5199
News	0.2163***	0.2929	0	2.292	3.11	15.6483
PBR	12.2391***	61.8758	0.3181	596.1208	7.9194	67.5947

Panel A: Before COVID-19 (2016-2019)						
	Mean	**Std. Dev.**	**Min**	**Max**	**Skewness**	**Kurtosis**
Sample 1 – High ESG dislcosure score (132 firms)						
Wo Em	37.0168***	13.9115	5.75	75	0.2213	2.4025
Wo Bo	26.0601***	10.9255	0	60	0.2251	3.1339
Beta	-0.5491*	6.18	-36.35	46.1282	-0.4987	16.5548
Analyst	3.7966***	0.6308	1.818	5	-0.1892	2.6843
Panel B: COVID-19 (2020)						
	Mean	**Std. Dev.**	**Min**	**Max**	**Skewness**	**Kurtosis**
Sample 1 – High ESG disclosures score (132 firms)						
ROA	0.5775	8.6884	-26.2393	32.6249	-0.6015	5.9612
ROE	5.3696	37.3168	-170.2447	242.2636	1.4042	20.6335
ESG	50.2177***	7.2638	35.124	70.1245	0.5733	2.8076
Ln(TA)	9.3751***	1.8494	6.4207	14.9088	0.8632	3.328
TL/TA	0.6386***	0.2233	0.0762	1.1652	-0.2117	2.5041
News	0.2312***	0.3445	0	2.29	3.1972	15.6752
PBR	2.9923***	3.4416	0.2375	20.824	2.6438	11.2888
Wo Em	36.9974***	15.9722	1.71	75	0.2297	2.2384
Wo Bo	33.0467***	8.1601	11.111	57.143	0.1624	2.8436
Beta	1.2407***	1.5364	-3.8562	5.8553	-0.0163	4.6007
Analyst	3.7169***	0.6427	1.833	5	-0.2637	2.5218
Sample 2 – Low ESG disclosures score (134 firms)						
ROA	4.0714***	12.917	-23.3437	84.9027	2.4184	16.3712

Panel A: Before COVID-19 (2016-2019)						
	Mean	**Std. Dev.**	**Min**	**Max**	**Skewness**	**Kurtosis**
Sample 1 – High ESG dislcosure score (132 firms)						
ROE	9.18**	44.0575	-167.6043	210.3004	0.7021	13.049
ESG	35.3208***	4.4505	26.0331	48.3471	0.3264	3.1287
Ln(TA)	7.7955***	1.3181	4.928	12.7199	0.7997	4.661
TL/TA	0.5822***	0.2301	0.0972	1.0744	-0.0781	2.3674
News	0.1307***	0.2507	0	1.851	4.21	24.9103
PBR	7.7217**	36.9181	0.2129	390.1992	10.0723	104.7337
Wo Em	37.9608***	14.3931	8.007	76	0.3393	2.6618
Wo Bo	34.2979***	8.9628	12.5	62.5	0.2884	2.9762
Beta	1.7349***	1.5325	-2.7949	7.1507	0.4234	5.0157
Analyst	3.8547***	0.701	1.8	5	-0.473	2.7621

Note: Mean denotes the average value. Std. Dev. denotes the standard deviation. Min denotes the minimal value. Max denotes the maximal value. Skewness and kurtosis denote the 3rd and 4th moments of the distribution of the variables. ***, **, and * denote statistical significance at the 1%, 5%, and 1% levels, respectively.

Table 6 – GMM panel regression results with annual data

Dependent variable	**ROA**		**ROE**	
	Sample 1	**Sample 2**	**Sample 1**	**Sample 2**
ESG	0.0422	-0.5085	0.6280	-2.2910
	(0.1607)	(0.4705)	(0.8458)	(1.9231)
Ln(TA)	-0.7756	**-8.5068***	-0.8296	-29.9552
	(0.9247)	(4.8718)	(3.8215)	(21.6974)
TL/TA	-9.8771	0.7809	2.7398	67.9288
	(6.6652)	(16.1721)	(30.0379)	(90.6902)
News	**1.3595***	-3.1227	8.2220	-21.8505
	(0.8101)	(2.8401)	(5.9087)	(13.3235)
PBR	0.3067	0.1132	1.0031	**1.2495****
	(0.2379)	(0.0903)	(0.7821)	(0.5138)
Wo_Em	-0.0353	0.3267	-0.0694	1.1670
	(0.0814)	(0.3128)	(0.4487)	(1.2017)
Wo_Bo	0.0555	**0.6949***	0.1425	2.5294
	(0.0691)	(0.3691)	(0.2929)	(1.6252)
Beta	0.0459	0.1095	0.1199	0.5621
	(0.0669)	(0.1513)	(0.3203)	(0.4822)
Analyst	**2.4195****	-3.6863	**8.7005***	-5.2191
	(0.9803)	(3.1172)	(4.5504)	(9.6228)
D_2020	**-3.8345*****	**-7.8470***	-12.0769	-36.3913
	(1.3601)	(4.5249)	(9.9573)	(30.6607)
N	615	560	615	560
Hansen test	111.8703	93.9423	113.9067	100.9856
	[0.6166]	[0.9424]	[0.5637]	[0.8542]
AR(1) test	-2.0273	-1.4593	-2.8888	-0.4541

Dependent variable	**ROA**		**ROE**	
	Sample 1	**Sample 2**	**Sample 1**	**Sample 2**
	[0.0426]	[0.1445]	[0.0039]	[0.6498]
AR(2) test	0.7750	-1.0283	-0.4953	0.8835
	[0.4383]	[0.3038]	[0.6204]	[0.3770]

Note: See the notes to Table 5. Sample 1 is composed of firms with high ESG disclosure score (132 firms). Sample 2 is composed of firms with a low ESG disclosure score (134 firms).

The second difference is that there is a significant and positive coefficient of news heat for firms in sample 1, while this is not the case for firms in sample 2. The third difference is that the percentage of women on board has a significant and positive coefficient for firms in sample 2, while this is not the case for firms in sample 1. Analyst recommendation has a positive and significant coefficient for firms in sample 1, while this is not the case for firms in sample 2.

In Table 6, there is an important result[3] related to the dummy variable for 2020. It has a significant and negative coefficient on the financial performance of firms, measured by ROA. However, this negative coefficient is much larger for firms with a low ESG disclosure score than for firms with a high ESG disclosure score. This result is important because it shows that the negative effect of the COVID-19 pandemic in 2020 is larger for firms with a low ESG disclosure score. However, the result is quite different when we consider ROE as the measure of financial performance. Only the price-to-book ratio and analyst recommendation have a significant coefficient on the ROE. For each of them, the coefficient differs between firms with high and low ESG disclosure scores.

Conclusion

This study investigated the role of ESG disclosure in the mitigation of negative shocks led by the COVID-19 pandemic. To do so, we analyzed a sample of 350 UK firms in the FTSE350 index using both daily data and annual data. The daily data sample from 2018 to 2021 is used to consider stock performance (return, Sharpe ratio, and Treynor ratio). The annual data sample from 2016 to 2020 is used to consider financial performance in an accounting sense (ROA and ROE) while directly including the annual ESG disclosure score in the regression analysis. Based on the ESG disclosure score for 2020, we divide the whole sample into three subsamples. The first is composed of firms with a high ESG disclosure score (above the median). The second is composed of firms with a low ESG disclosure score (below the median), and the third is composed of firms that have no ESG disclosure score due to a lack of data on ESG reporting. Two subperiods are considered in the daily data analysis: before the COVID-19 pandemic (07/2018-02/2020) and during the COVID-19 pandemic (03/2020-07/2021). Panel data

3. To check the robustness of our results, we also re-estimate all the equations in the empirical analysis of the paper while excluding extreme values of the variables, at the 2.5% and 5% levels. This robustness check shows that the results remain qualitatively similar and the main conclusions hold after excluding outliers. The results of this robustness check are available from the authors upon request.

regressions on both the daily and annual data are performed to detect the relationship of various driving factors with the stock and financial performance of firms in each subsample. Overall, our results show that the transparency of ESG reporting has a netagive relationship with the volatility of stock performance during the COVID-19 pandemic. Furthermore, firms with a high ESG disclosure score have a lower negative coefficient on considered driving factors for both stock and financial performance. These factors are particularly related to the COVID-19 pandemic, such as the announcement lockdown and quantitative easing by by the government central bank.

These findings lead us to suggest that ESG reporting can play an important role in firms' ability to mitigate risk during crisis periods. Indeed, quality ESG reporting can help firms better identify risks and opportunities related to the environment, climate change, social changes, and governance changes (Bernardi, Stark, 2018). This partly contributes to preparing firms for a social and environmental shock such as the COVID-19 pandemic (Yeon *et al.*, 2021). Thus, the efforts of firms in ESG reporting allow them to consider the long-term development path of firms while improving the trust of their stakeholders (Choi and Wang, 2009). The results of this study also raise the necessity to innovate with the application of big data and artificial intelligence to improve the construction, collection, and treatment of ESG data (Pan *et al.*, 2021). This can help companies, investors, asset management companies, and regulators enhance the quality of ESG reporting and therefore that of sustainable investing. To conclude, innovations in ESG reporting and analysis can help better promote responsible and sustainable finance by considering ESG quality in the asset allocation and financial management process. To this regard, finance and innovations have always been closely connected, as stated by Laperche and Burger-Helmchen (2019) and Ülgen (2019). We are thus confident that technological innovations will continue its contribution to the development of sustainable finance.

REFERENCES

AERTS, W., CORMIER, D., MAGNAN, M. (2008), Corporate Environmental Disclosure, Financial Markets and the Media: An International Perspective, *Ecological Economics*, 64(3), 643-659.

ARELLANO, M., BOND, S. (1991), Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations, *The Review of Economic Studies*, 58(2), 277-297.

ARORA, S., SUR, J. K., CHAUHAN, Y. (2021), Does Corporate Social Responsibility Affect Shareholder Value? Evidence from the COVID-19 crisis, *International Review of Finance*, In Press, 12353.

ASSADI, D., ASHTA, A., JUNG, A. (2018), A Tale of Three Musketeers of Alternative Finance: Stagnating Microcredit, Growing P2P Online Lending and Striving for Slow Money, *Journal of Innovation Economics & Management*, 26(2), 13-36.

AUER, B. R., SCHUHMACHER, F. (2016), Do Socially (ir)Responsible Investments Pay? New Evidence from International ESG Data, *The Quarterly Review of Economics and Finance*, 59, 51-62.

AYTAC, B., HOANG, T. H. V., LAHIANI, A., MICHEL, L. (2020), Working Capital Management and Profitability of Wine Firms in France: An Empirical Analysis, *International Journal of Entrepreneurship and Small Business*, 41(3), 368-396.

BAE, K. H., EL GHOUL, S., GONG, Z. J., GUEDHAMI, O. (2021), Does CSR Matter in Times of Crisis? Evidence from the COVID-19 Pandemic, *Journal of Corporate Finance*, 67, 101876.

BANOS-CABALLERO, S., GARCIA-TERUEL, P. J., MARTINEZ-SOLANO, P. (2012), How Does Working Capital Management Affect the Profitability of Spanish SMEs?, *Small Business Economics*, 39, 517-529.

BARBÉRIS, J. J., BRIERE, M. (2020), ESG Resilience During the Covid Crisis, *CEPS*, 9 July 2020.

BAUER, R., HANN, D. (2010), Corporate Environmental Management and Credit Risk, *SSRN*, 1660470.

BERNARDI, C., STARK, A. W. (2018), Environmental, Social and Governance Disclosure, Integrated Reporting, and the Accuracy of Analyst Forecasts, *The British Accounting Review*, 50(1), 16-31.

BIRKIN, A., STOESS, P. (2020), Three Ways ESG Factors can Make Portfolios more Resilient Post COVID-19, *EY*, 11 August 2020. Link: https://www.ey.com/en_gl/financial-services-emeia/three-ways-esg-factors-can-make-portfolios-more-resilient-post-covid-19

BRAMMER, S., PAVELIN, S. (2006), Voluntary Environmental Disclosures by Large UK Companies, *Journal of Business Finance & Accounting*, 33(7-8), 1168-1188.

BROADSTOCK, D. C., CHAN, K., CHENG, L. T., WANG, X. (2021), The Role of ESG Performance During Times of Financial Crisis: Evidence from COVID-19 in China, *Finance Research Letters*, 38, 101716.

BROOKS, C., OIKONOMOU, I. (2018), The Effects of Environmental, Social and Governance Disclosures and Performance on Firm Value: A Review of the Literature in Accounting and Finance, *The British Accounting Review*, 50(1), 1-15.

CHAMPAGNE, C., COGGINS, F., SODJAHIN, A. (2021), Can Extra-Financial Ratings Serve as an Indicator of ESG Risk?, *Global Finance Journal*, In Press, 100638.

CHOI, J., WANG, H. (2009), Stakeholder Relations and the Persistence of Corporate Financial Performance, *Strategic Management Journal*, 30(8), 895-907.

CERQUETI, R., CICIRETTI, R., DALO, A., NICOLOSI, M. (2021), ESG Investing: A Chance to Reduce Systemic Risk, *Journal of Financial Stability*, 54, 100887.

CLARK, J., MAUCK, N., PRUITT, S. W. (2021), The Financial Impact of COVID-19: Evidence from an Event Study of Global Hospitality Firms, *Research in International Business and Finance*, 101452.

DEMERS, E., HENDRIKSE, J., JOOS, P., LEV, B. (2021), ESG did not Immunize Stocks During the COVID-19 Crisis, but Investments in Intangible Assets did, *Journal of Business Finance & Accounting*, 48(3-4), 433-462.

DING, Z., LIU, Z., ZHANG, Y., LONG, R. (2017), The Contagion Effect of International Crude Oil Price Fluctuations on Chinese Stock Market Investor Sentiment, *Applied Energy*, 187, 27-36.

ECCLES, R. G., IOANNOU, I., SERAFEIM, G. (2014), The Impact of Corporate Sustainability on Organizational Processes and Performance, *Management Science*, 60(11), 2835-2857.

ENIKOLOPOV, R., PETROVA, M., STEPANOV, S. (2014), Firm Value in Crisis: Effects of Firm-Level Transparency and Country-Level Institutions, *Journal of Banking & Finance*, 46, 72-84.

FATEMI, A., GLAUM, M., KAISER, S. (2018), ESG Performance and Firm Value: The Moderating Role of Disclosure, *Global Finance Journal*, 38, 45-64.

FOSU, S., DANSO, A., AHMAD, W., COFFIE, W. (2016), Information Asymmetry, Leverage and Firm Value: Do Crisis and Growth Matter?, *International Review of Financial Analysis*, 46, 140-150.

GARCIA, S. G., MENDES-DA-SILVA, W., ORSATO, R. J. (2017), Sensitive Industries Produce Better ESG Performance: Evidence from Emerging Markets, *Journal of Cleaner Production*, 150, 135-147.

HADDOCK, J. (2005), Consumer Influence on Internet Based Corporate Communication of Environmental Activities: the UK Food Sector, *British Food Journal*, 107(10).

HE, H., HARRIS, L. (2020), The Impact of COVID-19 Pandemic on Corporate Social Responsibility and Marketing Philosophy, *Journal of Business Research*, 116, 176-182.

HOANG, T. H. V., PRZYCHODZEN, J., PRZYCHODZEN, W., SEGBOTANGNI, E. (2021), Environmental Transparency and Performance: Does the Corporate Governance Matter?, *Environmental and Sustainability Indicators*, 10, 101123.

HOANG, T. H. V., PRZYCHODZEN, J., PRZYCHODZEN, W., SEGBOTANGNI, E. (2020), Does it Pay to Be Green? A Disaggregated Analysis of US Firms with Green Patents, *Business Strategy and the Environment*, 29(3), 1331-1361.

HUANG, D. Z. X. (2019), Environmental, Social and Governance (ESG) Activity and Firm Performance: A Review and Consolidation, *Accounting & Finance*, In Press.

LAPERCHE, B., BURGER-HELMCHEN, T. (2019), Innovation: The Janus Face of Finance, *Journal of Innovation Economics & Management*, 29(2), 1-5.

LI, Y., GONG, M., ZHANG, X. Y., KOH, L. (2018), The Impact of Environmental, Social, and Governance Disclosure on Firm Value: The Role of CEO Power, *The British Accounting Review*, 50(1), 60-75.

LINS, K. V., SERVAES, H., TAMAYO, A. (2017), Social Capital, Trust, and Firm Performance: The Value of Corporate Social Responsibility During the Financial Crisis, *The Journal of Finance*, 72(4), 1785-1824.

LU, W., TAYLOR, M. E. (2016), Which Factors Moderate the Relationship between Sustainability Performance and Financial Performance? A Meta-Analysis Study, *Journal of International Accounting Research*, 15(1), 1-15.

MALIK, M. (2015), Value-enhancing Capabilities of CSR: A Brief Review of Contemporary Literature, *Journal of Business Ethics*, 127(2), 419-438.

MATHER, P., RANASINGHE, D., UNDA, L. A. (2021), Are Gender Diverse Boards more Cautious? The Impact of Board Gender Diversity on Sentiment in Earnings Press Releases, *Journal of Contempory Accounting & Economics*, 17(3), 100278.

MOHSNI, S., OTCHERE, I., SHAHRIAR, S. (2021), Board Gender Diversity, Firm Performance and Risk-Taking in Developing Countries: The Moderating Effect of Culture, *Journal of International Financial Markets, Institutions and Money*, 73, 101360.

MITTON, T. (2002), A Cross-firm Analysis of the Impact of Corporate Governance on the East Asian Financial Crisis, *Journal of Financial Economics*, 64(2), 215-241.

NGUENA, C. (2019), On Financial Innovation in Developing Countries: The Determinants of Mobile Banking and Financial Development in Africa, *Journal of Innovation Economics and Management*, 29(2), 69-94.

NIGAM, N., MBAREK, S., BENETTI, C. (2018), Crowdfunding to Finance Eco-innovation: Case Studies from Leading Renewable Energy Platforms, *Journal of Innovation Economics & Management*, 26(2), 195-219.

ORLITZKY, M., SCHMIDT, F. L., RYNES, S. L. (2003), Corporate Social and Financial Performance: A Meta-Analysis, *Organization Studies*, 24(3), 403-441.

PAN, S. L., CARTER, L., TIM, Y., SANDEEP, M. S. (2021), Digital Sustainability, Climate Change, and Information System Solutions: Opportunities for Future Research, *International Journal of Information Management*, 102444.

PEREZ DE TOLEDO, E., BOCATTO, E. (2014), The Impact of Environmental, Social and Governance (ESG) standards on the Value of Cash Holdings: Evidence from Canadian Firms, *2014 Canadian Academic Accounting Association (CAAA) Annual Conference*.

QADAN, M., NAMA, H. (2018), Investor Sentiment and the Price of Oil, *Energy Economics*, 69-C, 42-58.

RASIMAKI, E. (2021), *The Market Value of ESG during COVID-19 Market Crash in Europe*, Working Paper, Aalto University.

RENNEBOOG, L., TER HORST, J., ZHANG, C. (2008), Socially Responsible Investments: Institutional Aspects, Performance, and Investor Behavior, *Journal of Banking &Finance*, 32(9), 1723-1742.

REVELLI, C., VIVIANI, J. L. (2015), Financial Performance of Socially Responsible Investing (SRI): What Have we Learned? A Meta-Analysis, *Business Ethics: A European Review*, 24(2), 158-185.

SCHULER, D. A., CORDING, M. (2006), A Corporate Social Performance: Corporate Financial Performance Behavioral Model for Consumers, *Academy of Management Review*, 31(3), 540-558.

SELMI, R., HAMMOUDEH, S., ERRAMI, Y., WOHAR, M. E. (2021), Is COVID-19 Related Anxiety an Accelerator for Responsible and Sustainable Investing? A Sentiment Analysis, *Applied Economics*, 53(13), 1528-1539.

SHAFER, M., SZADO, E. (2019), Environmental, Social, and Governance Practices and Perceived Tail Risk, *Accounting & Finance*, 60(4), 4195-4224.

TAKAHASHI, H., YAMADA, K. (2021), When the Japanese Stock Market Meets COVID-19: Impact of Ownership, China and US Exposure, and ESG Channels, *International Review of Financial Analysis*, 74, 101670.

ÜLGEN, F. (2019), Innovation Dynamics and Financialization: Is Another Regulation Possible to Re-industrialize the Economy, *Journal of Innovation Economics & Management*, 29(2), 133-158.

UMAR, Z., GUBAREVA, M. (2021), The Relationship between the COVID-19 Media Coverage and the Environmental, Social and Governance Leaders Equity Volatility: A Time-Frequency Wavelet Analysis, *Applied Economics*, 53(27), 3193-3206.

YEON, J., SONG, H. J., YU, H. C., VAUGHAN, Y., LEE, S. (2021), Are Socially Responsible Firms in the US Tourism and Hospitality Industry Better Off During COVID-19?, *Tourism Management*, 85.

YU, E. P. Y., LUU, B. V. (2021), International Variations in ESG Disclosure: Do Cross-Listed Companies Care More?, *International Review of Financial Analysis*, 75, 101731.